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MARIANO MARTIN

Editor PPT

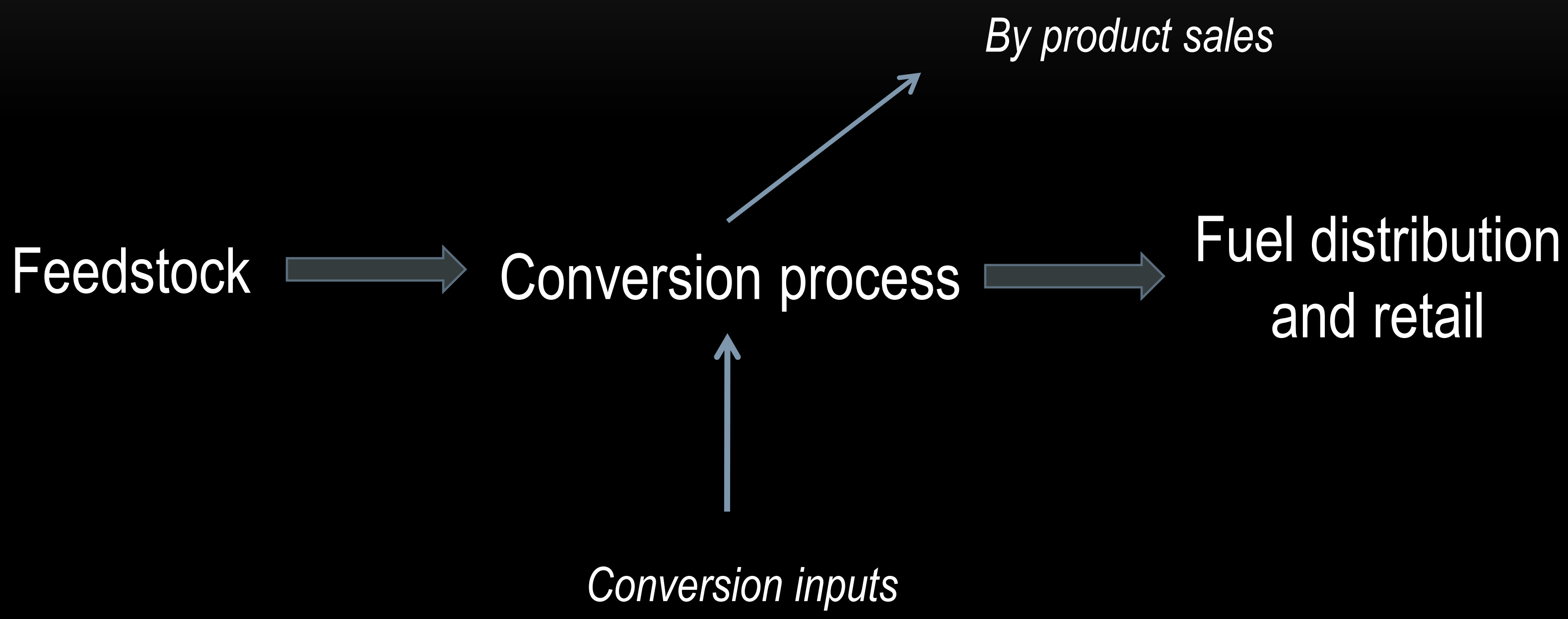
BIOGRAPHY

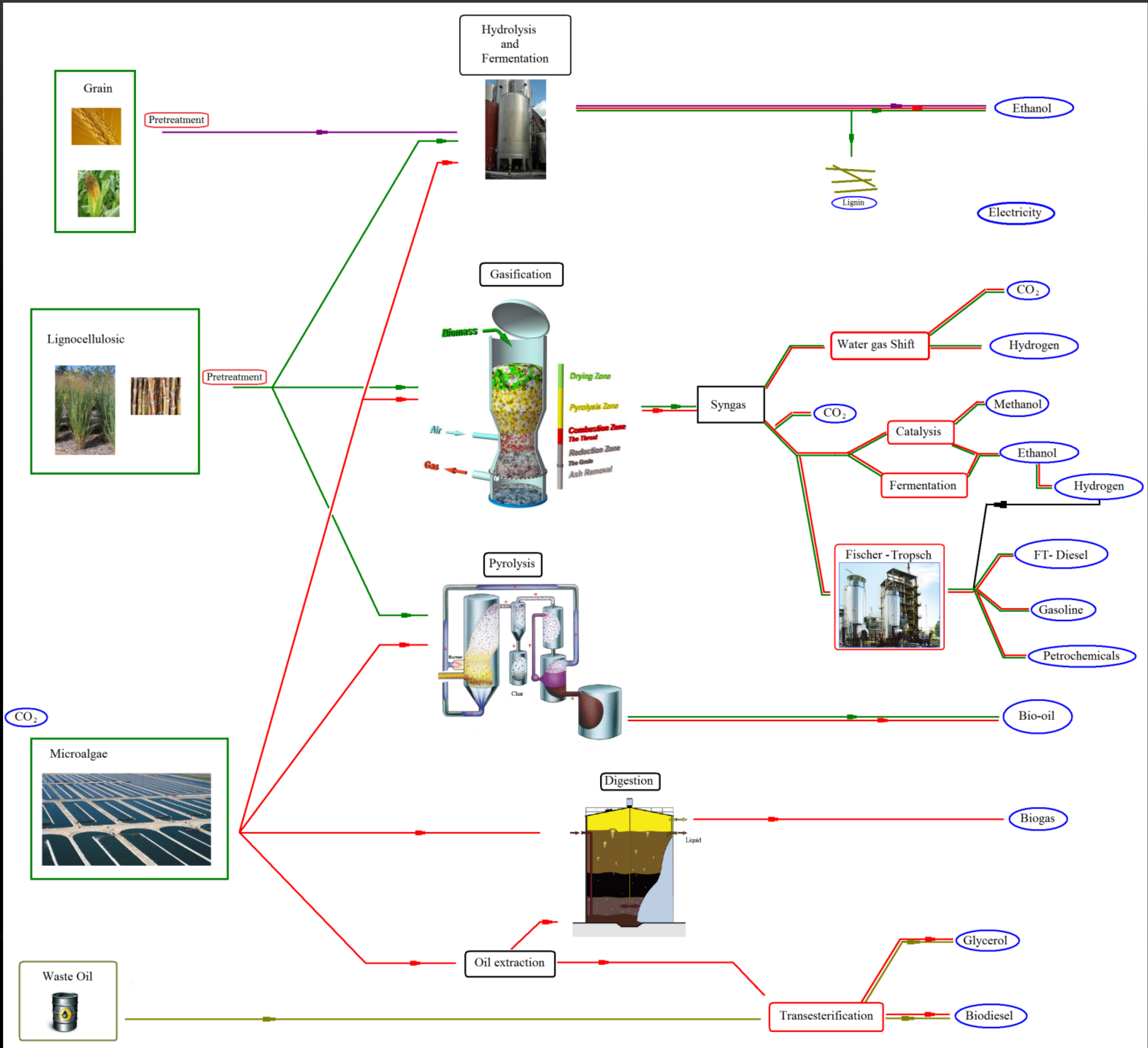
- Dr. Martin obtained a FPU predoctoral fellowship from the ministry of Science in Spain to carry out his PhD. He graduated in 2008 with honors and was recipient of the Outstanding PhD award from the University of Salamanca. Dr. Martin joined Procter and Gamble, Newcastle Technical Centre, for a postdoctoral appointment at Modeling and Simulation dealing with complex chemical reactors, for which he received the P&G award for his contributions to modeling and simulation. Next, her was awarded a Fulbright Postdoctoral Fellowship at CMU. Currently, Dr. Martin is also Mobility coordinator for the Chemical engineering degree and Head of the Master Studies in Chemical Engineering at Univ. Salamanca. Prof. Martin is coauthor of 49 papers in international Journals and 13 book chapters, his h index is 15 and editor of a undergraduate textbook. He has also presented 49 papers in international conferences and prepared international teaching material.
- His research interests include renewable based energy and fuels production.
  - Biofuels production
  - Solar and wind energy to chemicals

RECENT PUBLICATIONS

- Bueno, L., Toro, C.A., Martín M Techno-economic evaluation of the production of added value polymers from glycerol.Chem Eng. Res. Des. 10.1016/j.cherd.2014.05.010
- Davis, W., Martín, M Optimal year-round operation for methane production from CO_2 and Water using wind and/or Solar energy. J. Cleaner Prod. 80 , 252-261.
- Martín, M.; Grossmann, I.E. Simultaneous dynamic optimization and heat integration for the co-production of diesel substitutes: Biodiesel (FAME & FAEE) and glycerol ethers from algae oil. Ind. Eng. Chem. Res. 53, 11371-11383
- Grossmann, I.E.,Martín, M., Yang, L. Review of Optimization Models for Integrated Process Water Networks and their Application to Biofuel Processes. COCHE. http://dx.doi.org/10.1016/j.coche.2014.07.003 5 101-109
- De la Cruz, V, Hernández, S,Martín M. Grossmann. I.E. Integrated synthesis of Biodiesel, Bioethanol, Ibutene and glycerol ethers from algae. Ind. Eng. Chem Res. 10.1021/ie5022738
- Martín, M.; Grossmann, I.E. Optimal simultaneous enhanced production of biodiesel and bioethanol from algae oil via Glycerol fermentation Applied. Energy. 10.1016/j.apenergy.2014.08.054
- Martín M (2014) On the challenges of the use and integration of renewable energy sources. Energy Research J. 5 (1) 1-3 **DOI :** 10.3844/erjsp.2014.1.3

BIOFUEL PRODUCTION


By product sales
Feedstock
Conversion process
Fuel distribution and retail
Conversion inputs



Hydrolysis and Fermentation
Grain
Pretreatment
Ethanol
Lignin
Electricity
Gasification
Biomass
Drying Zone
Pyrolysis Zone
Combustion Zone
Reduction Zone
Ash Removal
Air
Gas
Lignocellulosic
Pretreatment
Syngas
Water gas Shift
CO_2
Hydrogen
CO_2
Methanol
Catalysis
Ethanol
Fermentation
Hydrogen
Fischer - Tropsch
FT- Diesel
Gasoline
Petrochemicals
Pyrolysis
Char
Bio-oil
CO_2
Microalgae
Digestion
Liquid
Biogas
Oil extraction
Glycerol
Waste Oil
Transesterification
Biodiesel

LIQUID BIOFUEL FEED STOCKS

- Biodiesel – oil bearing crops
  - Rape seed, sunflower, soya oil, palm oil
  - Waste vegetable oils
- Bioethanol – starch and sugar crops
  - Cereals, sugar beet, sugar cane
- All feed stocks are traded on the food commodity markets
- Typically feedstock accounts for 40-50% of biofuel cost

Biomass resources	Supply systems	*Conversion*	End products
Oil bearing plants	Harvesting,	Chemical (trans esterification)	Transportation fuels (biodiesel, bioethanol)
Agricultural crops and residues	collection,	Physical chemical (extraction)	Solid fuels (wood pellets, charcoal)
Woody biomass	handling,	Biochemical (fermentation)	Heat Electricity
Industrial and municipal waste	and storage	Thermochemical (gasification)	

BIOMETHANE FEEDSTOCKS

- Commercial or domestic waste may provide a revenue for AD as a waste treatment option.
- Agricultural manures are used in partnership with farmers, with digestive spread back to land.
- Energy crops have a cost of lost food production.

SECOND GENERATION FUELS

- Wide range of input feed stocks

  Woody biomass, waste, etc

- Generally lower cost feed stocks
- Non-food crops so less competition with food
- Can use whole crops so get better land use and energy balance

OVERVIEW OF BIOFUEL PRODUCTION TECHNOLOGIES

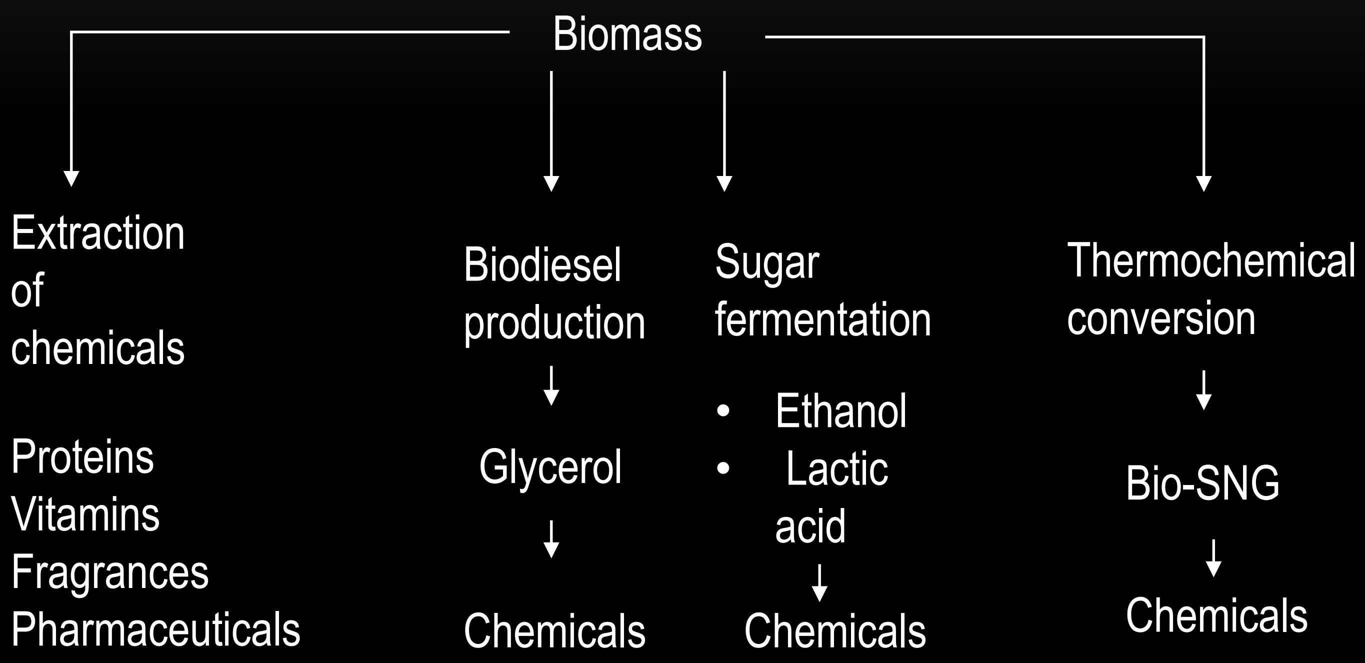
FIRST GENERATION OF BIOFUELS

Biofuel type	Specific name	Feedstock	Conversion Technologies
Pure vegetable oil	Pure plant oil (PPO), Straight vegetable oil (SVO)	Oil crops (e.g. rapeseed, oil palm, soy, canola, jatropha, castor, …)	Cold pressing extraction
Biodiesel	- Biodiesel from energy crops: methyl and ethyl esters of fatty acids - Biodiesel from waste	- Oil crops (e.g. rapeseed, oil palm, soy, canola, jatropha, castor, …) - Waste cooking/frying oil	- Cold and warm pressing extraction, purification, and transesterification - Hydrogenation
Bioethanol	Conventional bio-ethanol	Sugar beet, sugar cane, grain	Hydrolysis and fermentation
Biogas	Upgraded biogas	Biomass (wet)	Anaerobic digestion
Bio-ETBE		Bioethanol	Chemical Synthesis

OVERVIEW OF BIOFUEL PRODUCTION TECHNOLOGIES

SECOND/THIRD GENERATION BIOFUELS

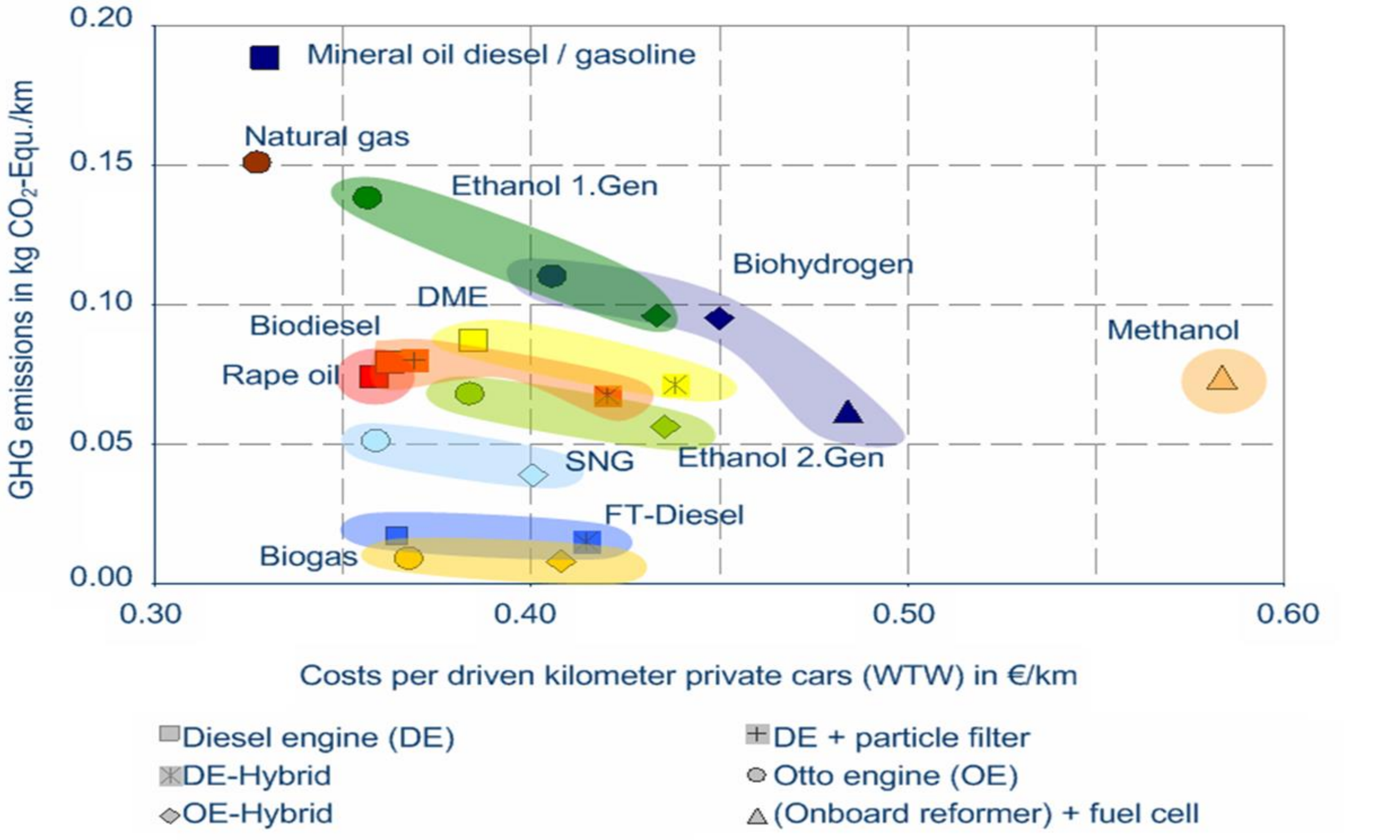
Biofuel type	Specific name	Feedstock	Conversion Technologies
Bioethanol	Cellulosic bioethanol	Lignocellulosic biomass and biowaste	Advanced hydrolysis & fermentaion Gasification & Synthesis
Biogas	SNG (Synthetic Natural Gas)	Lignocellulosic biomass and residues	Pyrolysis/Gasification
Biodiesel	Biomass to Liquid (BTL), Fischer-Tropsch (FT) diesel, synthetic (bio)diesel	Lignocellulosic biomass and residues	Pyrolysis/Gasification & synthesis
Other biofuels	Biomethanol, heavier (mixed) alcohols, biodimethylether (Bio-DME)	Lignocellulosic biomass and residues	Gasification & synthesis
Biohydrogen		Lignocellulosic biomass and biowaste	Gasification & synthesis or biological process


Biomass
Extraction of chemicals
Proteins
Vitamins
Fragrances
Pharmaceuticals
Biodiesel production
Glycerol
Chemicals
Sugar fermentation
• Ethanol
• Lactic acid
Chemicals
Thermochemical conversion
Bio-SNG
Chemicals

Biofuel production technology selection criteria:

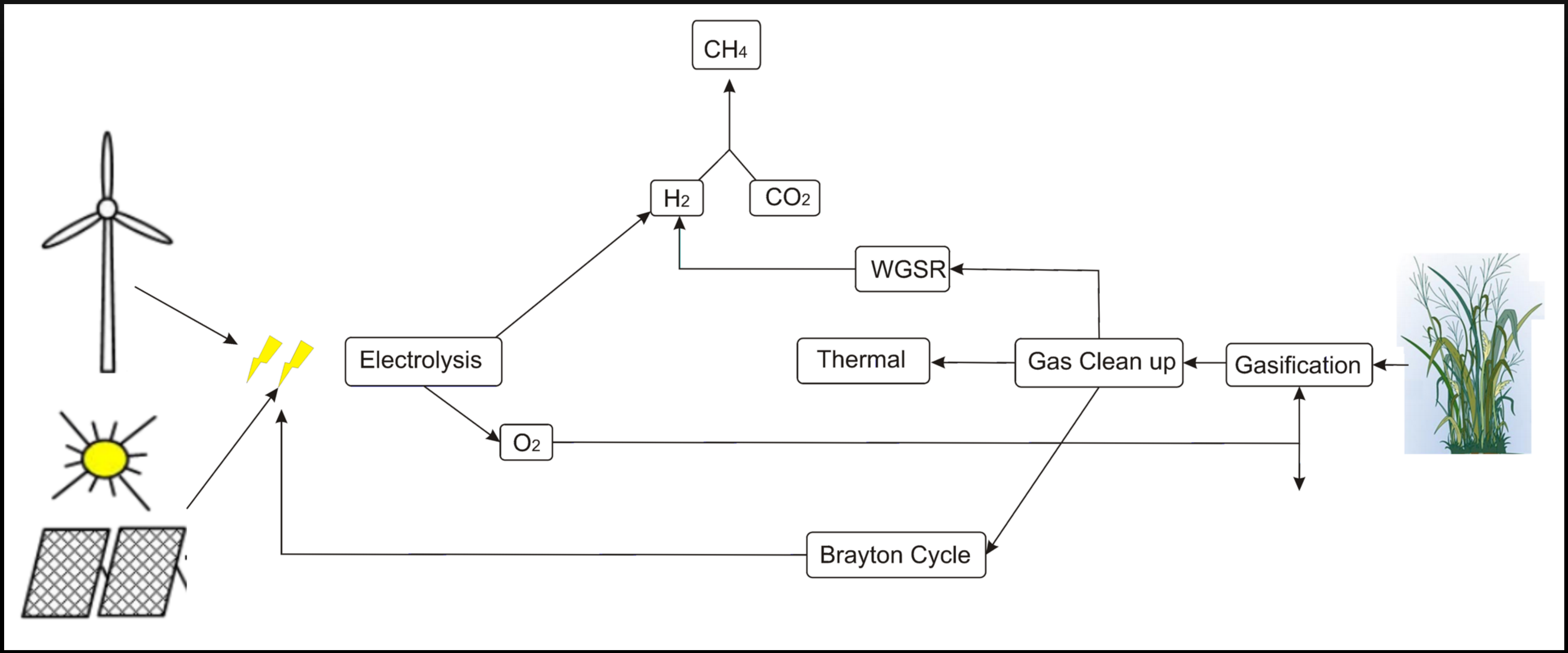
- Energy content
- Non renewable energy consumed
- Availability
- Carbon residue
- Sulfur content
- Viscosity
- Density
- Efficiency
- Scale up

COMPARISON OF TECHNOLOGIES ECONOMIC VERSUS ENVIRONMENTAL ASPECTS



SOLAR AND WIND

RENWABLES FOR CO2 REUSE



RELATED JOURNALS

Chemical Sciences Journal

Chemical Engineering & Process Technology

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